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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/622,165
Filing Date: July 17, 2003
Appellant(s): SCHALLER ET AL.

Gorden K. Harris, Jr.
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 8/21/2007 appealing from the Office action mailed 5/10/2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

Xu	US 6,551,732	April 22, 2003
Cownden	US 6,316,134	November 13, 2001

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 112. Claims 1-5 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for "incorporating the cathode exhaust line into an outer housing of the fuel cell or other component", fails to comply with the written description requirement because it does not reasonably provide enablement for "a heat exchanger coupled to the fuel cell for receiving waste heat *from the housing* of a fuel cell." The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Further, the amendment is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: "a heat exchanger coupled to the fuel cell for receiving waste heat *from the housing* of a fuel cell." With regard to the housing, the instant specification only indicates, "incorporating the cathode exhaust line into an outer housing of the fuel cell or other component."

Claim Rejections - 35 USC § 102. Claims 1-4 are rejected under 35 U.S.C. 102(e) as being anticipated by Xu (US 6,551,732.)

With regard to the limitation "a heat exchanger coupled to the fuel cell for receiving waste heat from the housing of the fuel cell", a recitation of the intended use of the claimed

invention, such as "for receiving" has been considered but is not given patentable weight. MPEP 2106 II, C and 2114 state, (in the section titled THE MANNER OF OPERATING THE DEVICE DOES NOT DIFFERENTIATE APPARATUS CLAIM FROM THE PRIOR ART,) A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987.) The heat exchanger is capable of receiving waste heat from the housing of the fuel cell.

Xu (US 6,551,732) teaches a fuel cell system comprising a fuel cell having a housing enclosing an anode chamber, a proton exchange membrane and a cathode chamber, the cathode chamber being separated from the anode chamber by the proton exchange membrane; a cathode supply line coupled to a supply of compressed oxygen-containing gas and to the cathode chamber; a fuel supply coupled to the anode chamber; a cathode exhaust gas line; a heat exchanger coupled to the fuel cell for receiving waste heat of the fuel cell; and an expansion turbine (cols. 5-6 and figure 1.) Heat exits the fuel cell via anode and cathode exhaust lines. The casing inherently transfers heat to the ambient environment. A combustor is connected to the cathode exhaust line to exchange the combusted heat and direct the cathode exhaust to the expansion turbine. The cathode exhaust gas line fluidly connects the cathode chamber and the expansion turbine with the heat exchanger being thermally coupled to the cathode exhaust gas line between the cathode chamber and the expansion turbine. The expander is coupled to the air compressor cathode source (col. 6, line 28 or the flow is used in a reforming process, (col. 6, lines 12-25.) Heat exchanging is noted in figure 1 prior to venting (col. 6, lines 20-22.) The heat

exchanger transfers heat energy from the fuel cell to cathode exhaust gas flowing through the cathode exhaust gas line. Thus, the claims are anticipated.

Claims 1-5 are rejected under 35 U.S.C. 102(e) as being anticipated by Cownden et al. (US 6,316,134.)

Cownden et al. (US 6,316,134) teaches a fuel cell system comprising a fuel cell having a housing enclosing an anode chamber, a proton exchange membrane and a cathode chamber, the cathode chamber being separated from the anode chamber by the proton exchange membrane, the housing adapted to transfer waste heat of the fuel cell; a cathode supply line coupled to a supply of compressed oxygen-containing gas and to the cathode chamber; a fuel supply coupled to the anode chamber; a cathode exhaust gas line; a heat exchanger coupled to the fuel cell for receiving waste heat of the fuel cell; and an expansion turbine, the cathode exhaust gas line fluidly connecting the cathode chamber and the expansion turbine, the heat exchanger being thermally coupled to the cathode exhaust gas line between the cathode chamber and the expansion turbine, whereby the heat exchanger transfers heat energy from the fuel cell to cathode exhaust gas flowing through the cathode exhaust gas line (claims, col. 17, line 45 to col. 18, line 55.) The cathode exhaust stream is advantageously used as a heat transfer fluid to assist in the thermal management of a fuel cell. Water in the cathode exhaust is condensed at low temperature and is removed through a water separator. The water is use to for reforming fuel and heat exchange. The cathode exhaust is used in an expansion turbine (col. 17, lines 45-end.) The cathode oxidant exhaust stream that acts as a coolant fluid in several fuel cell system components (see col. 17, line 45 to col. 18, line 55.) In col. 17, the exhaust is disclosed to act as

a coolant in several system components, line 60. In col. 18, line 13, the reference refers to the cathode exhaust stream as an indirect heat exchanger. The flow of the exhaust through the exhaust path coupled with the fuel cell forms a heat exchanger. The flow is from the cathode and the flow is directed to a turbine (col. 18, line 37.)

With regard to the limitation "a heat exchanger coupled to the fuel cell for receiving waste heat from the housing of the fuel cell", a recitation of the intended use of the claimed invention, such as "for receiving" has been considered but is not given patentable weight. MPEP 2106 II, C and 2114 state, (in the section titled THE MANNER OF OPERATING THE DEVICE DOES NOT DIFFERENTIATE APPARATUS CLAIM FROM THE PRIOR ART.) A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987.) The heat exchanger is capable of receiving waste heat from the housing of the fuel cell.

Claim Rejections - 35 USC § 103. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Xu (US 6,551,732) in view of Cownden et al. (US 6,316,134.)

The teachings of Xu (US 6,551,732) have been presented. The Xu (US 6,551,732) reference does not teach a cathode exhaust cooler and water separator connected between the cathode chamber and the heat exchanger. Cownden et al. (US 6,316,134,) however, teaches a PEM fuel cell with an anode chamber, a cathode chamber and a polymer electrolyte (claims, col. 17, line 45 to col. 18, line 55.) The cathode exhaust stream is advantageously used as a heat

transfer fluid to assist in the thermal management of a fuel cell. Water in the cathode exhaust is condensed at low temperature and is removed through a water separator. The water is use to for reforming fuel and heat exchange. The cathode exhaust is used in an expansion turbine (col. 17, lines 45-end.) It would be obvious to one of ordinary skill in the art at the time the invention was made to include a cathode exhaust cooler and water separator connected between the cathode chamber and the heat exchanger of Xu in order to accumulate water for the reforming process taught in both references. The skilled artesian would employ the excess water of Xu in order to reform a fuel source as taught in Cownden et al. (US 6,316,134.) The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

(10) Response to Argument

Claim Rejections - 35 USC § 112. Appellant argues that the specification provides support for the amendment (of 8/22/2006) to claim 1, which adds the limitation, "a *heat exchanger coupled to the fuel cell* for receiving waste heat *from the housing* of the fuel cell." Appellant cites paragraph [0018], page 4, of the specification, that waste heat can be transferred by, for example, incorporating the cathode exhaust line into an outer housing of the fuel cell. Additionally, Appellant argues that originally submitted claim 1 called for "the housing adapted to transfer waste heat of the fuel cell." Neither of these teachings provides support for "a *heat exchanger* coupled to the fuel cell for receiving waste heat *from the housing* of the fuel cell." For example, the housing may transfer heat from the fuel cell simply by being thermally conductive. An example of this would be a metal housing. The reference teaches a specific arrangement including a heat-exchanger. The arrangement does not support the claim language

added to claim 1. Incorporating the cathode exhaust line into an outer housing of the fuel cell is not a heat exchanger, as claimed, coupled to the fuel cell for receiving waste heat *from the housing* of the fuel cell.

As noted in the specification, "[0008] The fuel cell system also includes a cathode exhaust gas line, a heat exchanger coupled to the fuel cell for receiving waste heat of the fuel cell, and an expansion turbine. The cathode exhaust gas line fluidly connects the cathode chamber and the expansion turbine. The heat exchanger is thermally coupled to the cathode exhaust gas line between the cathode chamber and the expansion turbine, so that the heat exchanger can transfer energy from the waste heat of the fuel cell to cathode exhaust gas flowing through the cathode exhaust gas line."

This disclosure does not teach or imply that the *heat exchanger* is coupled to the fuel cell for receiving waste heat *from the housing* of the fuel cell. The disclosure teaches heat exchanger is thermally coupled to the cathode exhaust gas line between the cathode chamber and the expansion turbine, so that the heat exchanger can transfer energy from the waste heat of the fuel cell to cathode exhaust gas flowing through the cathode exhaust gas line. The cathode exhaust line and the heat exchanger are distinct elements and cannot be considered the same. The claim includes the limitation, "the cathode exhaust gas line fluidly connecting the cathode chamber and the expansion turbine, the heat exchanger being thermally coupled to the cathode exhaust gas line between the cathode chamber and the expansion turbine, *whereby the heat exchanger transfers heat energy from the fuel cell to cathode exhaust gas flowing through the cathode exhaust gas line.*" From this disclosure, it is clear that heat transferred to the cathode exhaust gas is distinct from the claimed heat-exchanger.

In addition, the claim is to a fuel cell system. The system comprises a fuel cell. As disclosed, the heat-exchanger is part of the system, and is coupled with the cathode exhaust line, however, the specification does not teach the heat-exchanger coupled with the fuel cell (for example, see figure 2.) The heat exchanger is coupled with the exhaust line. This is further evidence that the inventor(s) did not have possession of the claimed invention at the time the application was filed.

Claim Rejections - 35 USC § 102. Appellant argues that the Examiner's characterization of the Xu reference teaching use of a heat exchanger to make use of waste heat is incorrect. Furthermore, Appellants traverse the Examiner's characterization of "a heat exchanger coupled to the fuel cell for receiving waste heat from the housing of the fuel cell" as a recitation of the intended use of the claimed invention not entitled to patentable weight.

In response, it is noted that MPEP sections 2106 II, C and 2114 state, (in the section titled THE MANNER OF OPERATING THE DEVICE DOES NOT DIFFERENTIATE APPARATUS CLAIM FROM THE PRIOR ART) "A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987.)" As the heat exchanger is capable of directly or indirectly receiving waste heat from the housing of the fuel cell, the claims are anticipated.

Applicant argues that while Xu discloses an air compressor upstream of the fuel cell cathode, there is no disclosure or suggestion of using fuel cell-produced waste heat to add heat to the cathode exhaust via a heat exchanger. Applicant acknowledges that the fuel cell reactions are

known to be exothermic and generate excess heat. Heat exits the fuel cell via anode and cathode exhaust lines. The exhaust flows to a combustor, which couples the anode exhaust line with the cathode exhaust line in a heat-exchanging arrangement. Further, unreacted, excess hydrogen in the anode exhaust is burned in a combustor with the cathode exhaust and the resulting, heated, cathode exhaust, which is predominately oxygen, flows to the expander. The expander is coupled to the air compressor cathode source (col. 6, line 28 or the flow is used in a reforming process, (col. 6, lines 12-25.) Heat exchanging is noted in figure 1 prior to venting (col. 6, lines 20-22.) Thus, the heat exchanger receives waste heat of the fuel cell and transfers heat energy from the fuel cell to the cathode exhaust gas flowing through the cathode exhaust gas line. Further, the exhaust line inherently goes through the housing and therefore must accept heat from the housing when the housing has a temperature greater than the exhaust.

With regard to the housing, the interior and exterior surrounding environments will receive waste heat from the housing. The intended use statement of the claim does not require that the housing is physically coupled to the heat exchanger. The fuel cell is coupled to the heat-exchanger. If applicant considers heat transfer to the exhaust lines a heat exchanger, then simple exterior airflow along the housing must also be considered a heat exchanger. The rejection under 35 U.S.C. 112 is taken into account since no clear disclosure of what constitutes a heat exchanger is noted with regard to the housing. The heat exchanger needs only to be capable of accepting heat from the housing. Heat exchange between elements of a fuel cell and with the exterior environment will inherently occur with heat flowing from warmer areas of the fuel cell to cooler areas.

Appellant further argues that the characterization of Cownden is not correct because the rejection deals with Cownden's fuel processing system, not with an expander coupled to a compressor for the cathode input air pressurization, Appellant states that Cownden et al. contains no teaching or suggestion of taking waste heat from the housing of a fuel cell and transferring the waste heat energy to the cathode exhaust flow via a heat exchanger coupled between the fuel cell housing and the cathode exhaust line as set forth in Applicants' claim 1.

This argument is not persuasive. The Cownden reference teaches a cathode oxidant exhaust stream that acts as a heat-exchanging coolant fluid in several fuel cell system components (see col. 17, line 45 to col. 18, line 55.) In col. 17, the exhaust is disclosed to act as a coolant in several system components, line 60. In col. 18, line 13, the reference refers to the cathode exhaust stream as an indirect heat exchanger. The flow of the exhaust through the exhaust path coupled with the fuel cell forms a heat exchanger. The flow is from the cathode and the flow is directed to a turbine (col. 18, line 37.) Thus, the heat exchanger receives waste heat of the fuel cell and transfers heat energy from the fuel cell to the cathode exhaust gas flowing through the cathode exhaust gas line (col. 17, line 45 to end.)

Claim Rejections - 35 USC § 103. Appellant argues that the rejection under 35 U.S.C. 103 is improper for the reasons argued in the previous section. These arguments have been addressed.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

11/19/2007

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